

## REMARKS

In the Office Action of December 14, 2006, claims 1-14 were rejected under 35 U.S.C. 101 for failing to recite a practical application of an idea resulting in a useful, concrete and tangible result. Further, claims 1, 2, 7, 8, 10-13, 15, 18 and 19 were rejected under 35 U.S.C. 102(a) as anticipated by Dacorogna et al., "The Distribution of Extremal Foreign Exchange Rate Returns in Extremely Large Data Sets" (hereinafter Dacorogna 1995). Claims 3-6, 9, 14, 16 and 17 were indicated to be allowable if rewritten in independent form and if the § 101 rejection were overcome.

Applicants wish to thank the Examiner for the indication that claims 3-6, 9, 14, 16 and 17 are novel and unobvious.

As the Examiner is aware, applicants' invention is directed to methods of filtering time series data by testing for certain errors. A specific practical application of applicants' claimed methods as described at paragraphs 0002 and 0003 on page 1 of the specification is in the filtering of time series financial data such as a sequence of quotes for a financial instrument. The errors tested for include decimal error, scaling error, domain error, a monotonic series of quotes and a long series of quotes.

The nature of these errors is described in the specification. The testing of decimal errors is described in paragraphs 0323-0344 of the published application (page 44 to 48 of the specification). As explained in paragraph 0324, a decimal error can occur when cache memories are updated by partial updates of varying length rather than full refreshment of data. In this situation, subsequent partial update messages may assume that the cache data contains a decimal digit of a certain value established by a message that has been lost when, in fact, the cache contains a different decimal digit established by an earlier message. If a partial update message is lost, the portion remaining in the cache may no longer be correct and subsequent quotes may be in error. Such errors are called decimal errors in the specification.

For example, as described in paragraph 0325, assume a correct quote 1.5205/1.5215 where the first term is the bid price and the second term the ask price is stored in the cache in the form 1.5205/15. This price is then updated by the message "198/08" which reflects a new quote 1.5198/1.5208 but the message is lost so that the previous quote remains in the cache. If a new message "95/05" is then sent with the intention of changing the quote stored in cache to

1.5195/05, it will instead change the stored quote to 1.5295/05 since the last quote stored in cache was 1.5205/15.

The testing for decimal errors is described in paragraphs 0327 to 0344. These steps include testing for a value change between successive quotes that is close to a power of ten (paragraph 0328), testing the time interval between successive quotes (paragraph 0329), testing the validity of a corrected quoted (paragraph 0330), comparing the credibility of a corrected quote with the credibility of the original quote (paragraph 0331), and testing if the bad decimal digit remains the same throughout the decimal error (paragraph 0332).

Scaling errors are described at paragraphs 0345 to 0357 (pages 48 to 50 of the specification). These errors are changes in the scale of a quote by a constant factor relative to prior quotes. These might arise in the event of a revaluation of currency, a stock split or a change in quoting practices.

Applicants' process tests for scaling errors by testing for substantial changes between a new quote and a previous quote as detailed in paragraph 0348. In particular, in the embodiment described in paragraph 0348 the ratio of the current quote to the previous quote is tested to see if it falls between the square roots of 0.1 and 10. (The greater than sign at line 6 of paragraph 0348 should be a less than sign as will be evident on a moment's consideration and as is confirmed by the correct use of the less than sign in the next to last line of paragraph 0348.) If the ratio does not fall within these bounds, the value of the current quote is increased by the power of 10 that causes it to fall within these bounds. This power of 10 provides a new scaling factor.

Domain errors are described at paragraph 0284 of the published application (page 40, line 15 of the specification as filed) which states: "A domain error: an illegal level  $p$  of the filtered variable, i.e.,  $p < P_{\min}$  (as opposed to a merely implausible level)." Examples of domain errors in the case of bid-ask quotes are identified in paragraphs 0287, 0288, 0289 and 0292:  $p_{\text{bid}} < p_{\min}$ ,  $p_{\text{ask}} < p_{\min}$ ,  $p_{\text{ask}} < p_{\text{bid}}$ ,  $p_{\text{ask}} \leq p_{\text{bid}}$ . To understand the nature of the first two of these errors, it is necessary to realize that  $p_{\min}$  is the lower limit of the allowed domain of quotes as set forth in paragraph 0276. Thus, there is a domain error if a bid,  $p_{\text{bid}}$ , or an ask,  $p_{\text{ask}}$  is less than this lower limit. With respect to the last two examples of domain errors, since the bid should be less than the asking price, there is a domain error if  $p_{\text{ask}} < p_{\text{bid}}$  or  $p_{\text{ask}} \leq p_{\text{bid}}$ . As indicated in paragraph 0285, domain error quotes are rejected.

A monotonic series of quotes is a series of quotes that rise steadily or fall steadily. Such a series is sometimes inserted in the time series intentionally as described at paragraph 0379 to 0398 of the application (pages 52 to 55 of the specification).

A repeated series of quotes is a series of identical quotes. Such a series is sometimes inserted intentionally in the time series as described at paragraph 0399 to 0419 (pages 55 to 58 of the specification).

Claim 1 recites a method of filtering time series data by testing for decimal error, scaling error, domain error and data credibility.

The Dacorogna 1995 paper mentions a decimal error filter at the top of page 15. It indicates at the bottom of page 14 that the filter detects “wrong decimal digits due to failed text updates.” However, the Dacorogna paper does not indicate how the decimal error filter detects such wrong decimal digits.

The Dacorogna paper references two publications: Muller et al., “Statistical Study of Foreign Exchange Rates, Empirical Evidence of Price Change Scaling Law, and Intraday Analysis,” J. of Banking & Finance, 14, 1189-1208 (North-Holland 1990) (hereinafter Muller 1990) and Dacorogna et al., “A Geographical Model for the Daily and Weekly Seasonal Volatility in the Foreign Exchange Market,” J. of International Money and Finance, 12, 413-438 (1993) (hereinafter Dacorogna 1993). A copy of Muller 1990 is submitted herewith under an Information Disclosure Statement. Dacorogna 1993 was previously submitted with an IDS filed April 20, 2006.

Data error and filtering is discussed in an appendix at pages 436 and 437 of Dacorogna 1993 and at pages 1193-1194 of Muller 1990. Neither publication refers to decimal error filtering. Thus, the only reference to decimal error filtering is in the Dacorogna preprint which does not teach how the filtering is done. In the absence of any teaching in the Dacorogna paper of how to perform decimal error filtering, Dacorogna cannot anticipate applicants’ claim 1.

Dependent claims 2 through 10 are believed patentable for the same reasons claim 1 is patentable. The dependent claims are believed patentable for the additional reason that the references do not disclose the processes recited therein.

Claims 3-6 and 9 have been indicated to be allowable.

With respect to claim 2, it is respectfully submitted that Dacorogna 1995 does not disclose the step of detecting a monotonic series of quotes. As set forth in paragraph 0380, a

monotonic series in one in which the magnitudes of all elements are successively increasing or successively decreasing. The statement in Dacorogna 1995 at page 16, second paragraph, that the elements of a time series are equally spaced in time is not a disclosure of a monotonic series.

Claims 7 and 8 are believed patentable because Dacorogna does not disclose a process for testing for decimal error. As noted above, while Dacorogna mentions decimal error, he does not describe how he tests for it and he does not describe the specific tests enumerated in claims 7 and 8.

Independent claim 11 recites a method of filtering time series data including the step of testing for decimal error. It is believed patentable because Dacorogna does not teach a process for testing for decimal error.

Dependent claims 12-19 are believed patentable for the same reasons claim 11 is patentable. Several of these claims are similar to dependent claims 2-10 and are believed patentable for those reasons as well.

Claims 14, 16 and 17 have been indicated to be allowable.

Claim 13 is believed patentable for the same reason claim 2 is patentable.

Claims 18 and 19 are believed patentable for the same reasons claims 7 and 8 are patentable.

Dependent claims 20-24 have been added. Claims 20 and 21 which are dependent on claim 1 are patentable for the same reason claim 1 is patentable. In addition, these claims are believed patentable because they recite details of applicants' method of testing for scaling errors. In particular, claim 20 specifies that the ratio of the present quote and the previous quote is tested if it is within a predetermined range and, if it is not, the ratio is changed by a power of ten until it is within the predetermined range.

Dependent claim 22 is believed patentable for the same reason claim 9 is patentable and dependent claims 23 and 24 are patentable for the same reasons claims 20 and 21 are patentable.

The rejection of claims 1-19 under 35 U.S.C. 101 for lack of a practical application is respectfully traversed. Dacorogna 1995, Dacorogna 1993, Muller 1990 and the Rothman and Wood references previously cited by the Examiner are but a small sampling of the work being done on time series financial data. Such work is being done because it has practical applications resulting in useful, concrete and tangible results. The Signature Financial patent at issue in the State Street v. Signature Financial decision related to a system for generating a number

representing the value of a mutual fund holding at the end of the day. Such a system was found to produce a useful, concrete and tangible result. Fundamentally, the mutual fund valuation generated in the Signature Financial patent was a quote and a series of such numbers is one example of time series financial data. Just as the system of the Signature Financial patent was found to produce a useful, concrete and tangible result, so too the process of the present invention produces useful, concrete and tangible results.

Aside from the fee for an extension of time and additional claims, no additional fee is believed to be due for filing this response. However, if a fee is due, please charge such fee to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310.

If the Examiner believes a telephone interview would expedite prosecution of this application, she is invited to call applicant's attorney at the number given below.

Respectfully submitted,

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